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The Neolithic in Mediterranean Europe

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Abstract and Keywords

The Mediterranean region represented a significant zone for the transmission of the Neolithic and its farming economy. This essay reviews the different mechanisms and geographic constraints that influenced the movement of farming and cultural trends, and assesses the current interpretative models as well as traditional approaches in the context of recent archaeological discoveries and publication. Neolithic evidence across southern Europe, from the Near East, Aegean, north Africa and to Iberia and France, is described in the different regions and set against the current chronology. Key issues include the parallel development of settled farmers alongside mobile hunter-gatherers and their gradual assimilation into food producing societies, and the longevity of the typical Mediterranean economy.

Keywords: Mediterranean, Neolithic, colonization, islands, Anatolia, population, Wave of Advance model, farming, origins, domestication, pottery

Introduction: the Mediterranean as a melting pot

The Mediterranean provided the primary conduit for the movement of domestic plants and animals from the Near East to other landmasses and islands. The linkage between the pristine zone (Minnis 1985) of south-west Asian domestication and Neolithization in the Levant and Europe was modelled to a large extent on the nature of the Mediterranean 'lake' that was bordered by three continents. This juxtaposition of lacustrine-bordered landmasses doubtless influenced the nature of agricultural spread and adoption over a rapidly expanding area between c. 10 000 and 6000 years ago and the cultures that emerged from this process.

The Mediterranean sea is c. 2 505 000 km² in surface area, measures c. 4000 km east to west and c. 800 km north to south, and is enclosed by an indented coastline of enormous length between Asia, Africa, and Europe. It contains at least 1000 habitable islands, the largest of which, Sicily and Sardinia, cover some 25 000 km² each, and the island archipelagos provide 'stepping stones' for the dispersal of cultural and economic materials, ideas, and settlement. From later Palaeolithic times, larger islands adjacent to landmasses were exploited, enabled by low sea levels or the use of early sea craft. The basin of the Mediterranean is surrounded by upland *massifs* and rugged mountain chains (Atlas, Taurus, Pindos, Apennines, Alps, Pyrenees), some of which form the distinctive peninsulas dividing the basin into separate zones (Iberia, Italy, Balkans, Anatolia). Little of the region is classified as lowland, and coastal plains are mostly narrow and restricted, offering relatively limited landscape suitable for early Neolithic farming. The upland landscape, drained by river valleys with steep gorges and torrents and short, wide, and shallow 'wadis', often causes floods and catastrophic erosion once cleared of vegetation. The climate around the Mediterranean fringes is similar to the Levant, with hot dry summers and mild but often wet winters. Inland climates differ far more, especially in upland zones, with marked seasonal conditions and cool winters. Even coastal north Africa claims a Mediterranean climate. Whilst the domesticated plants and animals of south-west Asia were adapted to dryer, hotter conditions, the coastal environment of much of the Mediterranean might not have demanded much additional change. The hinterlands with their colder, wetter seasons, salty alluvial zones, and forested landscapes posed a far greater challenge, and the use of barley, sheep/goat, and upland pulses implies local modification and adaptation.

The contemporary Mediterranean landscape is changed out of all recognition. Forest clearance since the Neolithic, Roman exploitation of hillsides for commercial production of vines, olives, and cereals, historic overexploitation, and overpopulation have all contributed to soil erosion, changed ground water levels, and badlands. The classic Mediterranean landscape of peasant agricultural exploitation, portrayed by Braudel (1972; see also Barker 1995), was probably far less productive by the 16th century AD than at the beginning of the Neolithic, but many features, such as unstable soils, floods, and drought remain unchanged. Such conditions have perpetuated the seasonal use of different parts of the landscape for transhumance and upland stock farming, and lowland cereal production and settlement.

Scholarly background

The Neolithic has been the focus of scholarly study for barely a century in most parts of the Mediterranean, but landscape approaches since the Second World War, along with aerial photography, survey, soil and environmental study, and a very Mediterranean tradition of culture-sequence research, have revealed most of the regional Neolithic cultures. Some areas (such as the Aegean) have been popular for research, whilst others, such as north Africa, have been largely ignored.

Dating programmes since the 1960s have revolutionized our understanding of the antiquity of the Neolithic, resulting in the 'Wave of Advance' model (Ammerman and Cavalli Sforza 1971; 1973; 1984) combining evidence of genetic, linguistic, and cultural movement with an improving chronological framework. Current interests are diverse, including environmental and material approaches, alongside 'post-processual' studies exemplified by projects such as Çatal Höyük in central Anatolia (Hodder 1996; 2000) and phenomenological investigations (Skeates 2008; Tilley 2004; 2008). A lack of interpretative syntheses of Neolithic archaeology, however, hinders a detailed understanding of much of the region. It is still rare to find fieldwork programmes addressing the Neolithic as a primary research goal, and few sites are examined within their wider economic landscapes, or subject to soil and seed, isotopic, population, dating, or environmental analyses. To compensate, explanatory models and simulation studies address key issues of

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how agricultural society spread across the region.

Mesolithic background and Neolithization

Despite the often insubstantial evidence for mobile hunter-gatherer groups, the Mediterranean basin and its hinterland provided rich and varied foraging landscapes—and most if not all the landscapes and at least the larger islands were probably known, exploited, and populated to some degree long before agriculture emerged. Mobility involved terrestrial, maritime, and riverine exploitation by Mesolithic communities capable of navigation, boat-raft building, and with a wide knowledge of their land and seascapes. Given this, the questions to ask are why and how economic strategies changed, and why some communities accepted novelty and innovation, whilst others remained conservative.

Changing environmental conditions almost certainly triggered change and innovation across the Near Eastern Levant (defined here as Syria, Jordan, Lebanon, Israel). The early Holocene (c. 10 000–6000 BC) saw remarkable ecological regeneration after the dry cold of the late Pleistocene in south-west Asian and Mediterranean landscapes (Roberts 1998; Moore 1983; Moore et al. 2000). Subsistence in the particular ecozones of the Levant, physically constrained by sea, mountain, and desert (Sherratt 1996; 2005), resulted in locally dense populations (Natufians) subsisting on intensive plant collecting and selective animal herding/culling. With a sudden downturn in the climate (Younger Dryas, mid 10th millennium BC), and with nowhere to go and diminishing economic resources, Pre-pottery Neolithic populations survived through the innovation of an entirely new approach to food procurement, processing, storage, and new products and husbandry practices (Moore and Hillman 1992). For early Neolithic populations, the eastern Mediterranean coastline (Anatolia, southern Greece, Cyprus, north Africa) offered similar environments to the Levant, but further west and north climatic seasonality became more marked, adaptation requiring considerable change and technical innovation. Here the early Holocene climate offered a near-ideal environment for late Mesolithic hunter-gatherer economies (Lewthwaite 1986; 1989; Pluciennik 2004; 2008) able to exploit the rich fauna and flora of the forests, lakes, estuaries, and coasts of the central and western Mediterranean. In consequence, well-established mobile traditional hunter-gatherers seemed reluctant to adopt permanent farming and settled life.

The significantly lower sea levels that persisted until c. 5000 BC promoted the movement of farming across the Mediterranean with large estuaries, large islands, and peninsulae providing extensive and connected landscapes. After c. 5000 BC sea levels rose, drowning these landscapes and reducing the useable territory. Mobile groups might have settled islands large enough to sustain hunting and gathering seasonally or permanently (cf. Dawson 2007; Malone 1999), but some areas (e.g. Cyprus, Crete, south-east Italy) adopted farming rapidly. Many forager groups lingered after farming arrived, as charted by recent surveys in the western Mediterranean uplands, islands, lake basins, coastal caves, and rock shelters (Giannitrapani and Pluciennik 2001; Malone and Stoddart 1994; Binder 2000; Zilhao 2000; Barker 1995; Biagi 1990; Pessina and Tiné 2008). A major problem for archaeologists is the location of sites documenting the transition from foraging to farming, with just a few examples currently known and published. Uzzo cave in Sicily (Costantini 1989; Pluciennik 1994; Cassoli and Tagliacozzo 1995; Mannino and Thomas 2007; Tagliacozzo 1993; 1994; Piperno et al. 1980; Tusa 1985) and Franchthi Cave in Greece (Jacobsen 1976; 1981; Hansen 1991; Payne 1975; Perlès 2001) revealed evolving subsistence strategies that included hunted or stranded marine mammals, deep-sea and inshore fish, molluscs, birds, small mammals, and plant foods. Further west, the transition seems far more gradual around, for example, the Tagus estuary in Spain, where Atlantic resources provided very different seasonal opportunities to Mediterranean rivers like the Ebro or the Rhône.

Neolithic 'origins' in the Near East and Anatolia



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Figure 1 Map of a modified 'wave of advance' in 200-km arcs, showing the expansion of Neolithic farming and culture into the Mediterranean with additional radiometric dates and broad ceramic groups (after Özdoğan in Hauptmann and Özdoğan 2007; Guilaine 2007).

Origins for domestication and farming lie in the Levant, where the wild progenitor populations of the main European domesticates (cattle, sheep, goat, pig, wheat, barley, lentils, peas, beans, various fruits, nuts, vegetables (Meadow 1989)) were available. Studies of Natufian hunter-gatherers and their successors demonstrate that the necessary pre-adaptations towards food production took place in the twelfth to eleventh millennia BC. Intensive food collecting—processing and herding—hunting strategies at base camps such as Ain Mallaha in Israel (Valla 1995) and Abu Hureyra in Syria (Moore and Hillman 1992; Moore et al. 2000) stimulated complex forager populations. From 'broad spectrum' collecting and hunting, the semi-mobile and growing hunter-gatherer groups focused on specific foods (gazelle, wild goat, wild wheat, barley, pulses). Larger sedentary communities (e.g. Jericho, Abu Hureyra, Ain Gazel) developed around increasingly domesticated foods derived from intensive herding and emergent agriculture. These Pre-pottery Neolithic cultures (distinguished locally as PPNA, PPNB and PPNC) adapted to presumed economic necessity in the tenth to ninth millennia BC (Bar Yosef 1995; Gopher 1995; Moore et al. 2000; Aurenche 2007; Hauptmann and Özdoğan 2007) through a focus on certain predictable, high-calorie/protein farmed foods and emergent technologies. From c. 8700–6500 BC, this economic model consolidated and expanded across the Near East and east Mediterranean coasts. The original 'Wave of Advance' model suggested a steady, almost measured expansion north and west from the heartland of the Levant coast. Recent chronologies show a much more haphazard pattern (Guilaine this volume; 2007) whereby some parts of Europe adopted Neolithic elements more rapidly than others, the economy and settlement funnelled along particular rivers, plains, coasts, and local communities. This pattern is suggested in Fig. 1, which combines both 'waves' and current dates within the broad cultural attributions of the earlier Neolithic.

Two repeating elements contribute to the distinctive pattern of Neolithic spread and acculturation across the Mediterranean: colonization by exotic peoples, foods, technologies, and ideas; and continuity of indigenous foragers and traditional subsistence strategies (Zvelebil and Rowley Conwy 1986). The former is seen as sophisticated, settled, and agricultural, the latter as mobile, small-scale, and culturally simple. Probably both are extremes of reality. The speed and success of Mediterranean Neolithization is down to well-adapted, opportunistic hunter-gatherers selecting elements from the Neolithic 'package' to suit their economic needs, social aspirations, and local environment. Given that the original transformation within the Levantine–east Mediterranean involved internally stimulated economic and cultural change, we can apply a version of this 'indigenous' model to the Mediterranean, albeit with the introduction of domesticates and some technologies.

Key elements of the primary Neolithic package transmitted from the Near East into south-east Europe and beyond were domestic species and ideas and

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technologies of how to live, build, make, eat, and cultivate. Mud-brick and daub houses (Flannery 1969), larger social groups, ground stone implements and vessels, pottery and plastic figurative 'art' and imagery, and new materials such as obsidian were some of the attractions to indigenous groups. So was the novelty of cereal foods and the potential to store them. These prestige foods may have provoked new beliefs, social values, and competition (Mithen 2003, 62–71), resulting in elaborate ritual and building programmes. The impressive ritual site of Göbekli Tepe (Schmidt 2007) in south-east Anatolia with its artistic focus on wild and hunted creatures may represent those new values. In essence, cultivated foods were prestigious and part of elaborate ritual and ceremony celebrating both the wild and the cultivated—this underpins the adoption of otherwise arduous farming and land tenure amongst former foragers.

Neolithic evidence in the Mediterranean

In spite of the momentous changes the transition to agriculture implies, physical evidence of that transformation is far more ephemeral and difficult to assess. At its most basic, Neolithic evidence comprises some four categories: economic (plants, animals, technical innovations); structural (settlements, houses, tombs, burials); material culture (pottery, tools); and, finally, the elusive changes to the wider environment, with soil, pollen, and environmental records documenting clearance and crop regimes (Barker 2006; Van Andel and Runnels 1995). Environmental evidence occurs episodically, and rarely does it provide the full picture of transformation, except when documented over centuries or millennia of activity in deeply stratified sites.

Economic evidence

Some recent research has shown the complexities of the evolving Neolithic economies of the Mediterranean, but there are few sites where routine environmental or dating studies have been conducted. Too often, pottery and stratigraphic lists take the place of a better understanding of the environment, landscape, and chronology of individual sites. Current questions include the role of local plants and animals in the process of domestication (e.g. pigs and cattle), the role of pastoralism, secondary products, dairying, isotope studies and diet, plant and animal genetics, and the role of hunted and collected food within the mixed yet increasingly agricultural economies of the region (Barker 2006). Studies rarely show the rate of change or the persistence of continuing systems, although this remains a fundamental aspect.

Settlement and regional culture

The definition of settlement remains tricky given that so few complete or substantial sites have been excavated across the region. Far more common are fragmentary occupation traces underlying later open sites, comprising pits, post holes, walls, hearths, rubbish, burials, and material culture. Cave and rock shelter occupations often include layers with Neolithic materials, but are difficult to interpret. Exceptions include the Neolithic tell sites of western Anatolia (Mellaart 1967; 1971; Özdoğan 1999) Bulgaria, and Thessaly, and the Neolithic ditched sites at Makriyalos (Greece) (Halstead 1999; Pappa and Besios 1999), the Tavoliere (south-east Italy), the Catania Plain (Sicily), and Valencia (Spain), but estimates of population density, settlement size, family group size, and so on remain obscure, as do the different functions of such sites. Surveys in the Acconia Plain in Calabria (Ammerman 1985), the Gubbio Valley in Umbria (Malone and Stoddart 1992; 1994), Calabria (Robb 2007), Thessaly (Perlès 1999), or eastern Crete (Tomkins 2008) give important insight into the elusive nature of early and developing Neolithic settlement, but it is easy to over-interpret what at the best is flimsy evidence (Halstead 1999, 80–81).

Burials and tombs

Early burials reflect the Near-Eastern emphasis on house association, with burials placed below floors, within ditches, or in storage pits, hearths, and other domestic structures. Formal burial in defined places, such as the ubiquitous rock cut tombs of much of the Mediterranean, developed c. 4500–4000 BC and became frequent in areas of suitable geology across the region, sometimes dominating burial practice until the protohistoric period. Megalithic and other stone-built structures similarly became a feature of many Mediterranean areas from the Levant to Portugal, and there has been much debate as to their origins, dates, and cultures. Until the late Neolithic, burials were sparsely furnished with grave goods (e.g. Çatal Höyük; Mellaart 1967), and pottery, personal ornaments, stone tools, and food were the main offerings. By the end of the 4th millennium BC, some tombs were well furnished, implying emerging social hierarchy, but the trend was for communal grave goods and collective burial. Individual burials dominated in some places, especially where associated with houses or caves, whilst megalithic and rock-cut tombs, given the necessary investment, involved larger numbers of people and collective rites. However, few sites were excavated or recorded properly. Only recently have detailed studies of bones, tomb contents, and locations begun to reveal the complexity of funerary practice.

Pottery

Pottery emerged some time after farming in the eastern Mediterranean, but often was the first signal of Neolithic change in the west (Table 1). Thus pottery cannot be considered a key marker of Neolithization, but a commodity within it. Earlier scholarship used pots to define people or their cultures, but now function, value, style, residues, material, technology, and so on are significant approaches.

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Table 1 Pottery emergence across the Mediterranean, indicating some of the earliest dated pottery sites.

Region	Spain	France	W. Med islands (Sardinia, Corsica, Balaerics, Sicily)	Italy	Balkans	Greece	Anatolia	Levant	Egypt-North Africa
Earliest dates	mid 6th mill. BC Cardial–Epi-Cardial	mid 6th mill. BC Cardial then Epi-Cardial	6th mill. BC Cardial	6th mill. BC Impressed in E, Cardial in W, red painted, scratched	6th mill. BC Cardial, Impressed and painted, and Danilo wares	7th mill. BC Plain and painted, Sesklo wares	7th mill. BC Plain and then painted wares	10th to 8th mill. BC first ceramics Early 7th mill. BC fully fired ceramics, plain, then painted	Early 5th mill. BC North Egypt delta, 4th mill. BC Inland 5th to 4th mill. BC Incised-Impressed-combed pottery
Sites	5900–5500 BC Cuartillas-Almeria La Draga-Catalonia Cova de l'Or-Alicante Cueva de Cendres-Alicante La Draga-Catalonia	6000–5500 BC Southern France-Liguria Arene Candide Grotte Gazel Fontbrégoua Jean Cros	Corsica c. 6000–5500 BC Sardinia Cardial c. 5500 BC Sicily c. 6000 BC Uzzo	SE Italy c. 6000 BC Marche c. 5700 BC central Italy c. 5300 BC N Italy c. 5300–4900 BC	Konispol, Albania c. 6000 BC; Gudjna 1 Southern Dalmatia c. 5800 BC Vižula, Istria c. 5560 BC	c. 6500–6000 BC Knossos c. 6300 Nea Nikomedia c. 6400 BC Achilleon c. 6200–6050 BC Franchthi Cave mid 7th mill. BC Cyprus-Sotira 6th mill BC	Çatal Hüyük c. 6500 BC Ulucakand c. 6400–5900 BC Haçilar Ilipinar, Fikintep, Karaağaçtepe, Coşkuntepe, Kuruçay	Mureibet Syria c. 9500 BC Tell Sabi Abyad III Syria c. 6900–6800 cal. BC	Merimde, Kom Saïs Lower Egypt c. 5200–4000 Hemamieh - Middle Egypt c. 5000–3500 BC Chafarinas Islands Morocco c. 4400–4100 BC Hassi Ouenzga Morocco 5600–5100 BC
Reference	Zilhao 2000; Chapman 2008	Binder 2000	Malone 2003; Costa et al. 2003	Malone 2003; Plucienik and Zvelebil 2008	Forenbaher and Miracle 2004	Perlès 2001 Swiney 2001	Takaoğlu 2005; Özdoğan 1998; 1999; 2005	Perlès 2001, 95–96	Barker 2006 Hoffman 1991 Belliver Garido et al. 2003

The presence of pottery in the western Mediterranean implies Mesolithic acquisition, rather than production (Binder 2000; Barnett 2000; Perlès 2001, 108; Whittle 1996). Ceramics may have moved as gift and food containers between incoming colonizing farming groups and indigenous populations during a slow filtering process of acculturation (e.g. Lewthwaite 1982; 1985; 1989). Selected items crossed the frontier between farming and indigenous groups, such as fine Cardial decorated pottery. Pottery, amongst other commodities, symbolized the prestige defining the food and feast of the incomers and lured indigenous locals into new social interaction and value systems. Pottery soon reflected local identities and cultural styles through distinctive forms (e.g. handles, footed vessels, painted, scratched, or modelled decoration). Modelled forms and ritual symbolism became distinctive in the Balkans and Malta (Trump and Cilia 2002), whilst elaborate decorative vessels circulated locally and more distantly in complex exchange networks anticipating later Neolithic–Eneolithic networks.

Lithics

Neolithic blade technology (longer, wider flakes suitable for pressure flaking) and polished and ground flint and hard stone tools (axes, adzes, and chisels, hollowed ground stone vessels) were distinctive innovations. Flint mines such as those at Defensola (Gargano), Monti Lessini (northern Italy), and Casa Montero (central Spain) imply organized early large-scale exploitation in the sixth to fifth millennia. Complex exchange networks moved utilitarian and prestige materials and objects over great distances, most famously with island obsidian (from Melos, Lipari, Pantelleria, Sardinia, and Palmarola), for several millennia. Exploitation began before Neolithic influence on Melos (as attested at Franchthi Cave, Perlès 2001, 36) and possibly also on Lipari.

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Regional developments

Anatolia was a principal filter for Neolithic economic and technological knowledge in the eighth to seventh millennia *bc*. Pottery, obsidian use, cattle, mud-brick and other building methods, figurative art, and social complexity were all transmitted to the Aegean and Balkan zones. Cyprus, exploited by hunter-gatherers from the 10th millennium *bc*, was settled by the mid ninth millennium *bc* and is the first island documenting the importation of domesticates (Peltenburg 2004; Peltenburg et al. 2001). Its combination of Levantine and Anatolian elements suggest settlers from these areas. The Aegean and Balkans represent the first major footholds for farming within mainland Europe, transferred via western Anatolia and Thrace (Özdoğan 1998). Crete (Isaakidou and Tomkins 2008), in parallel to Cyprus, shows earlier exploitation, an aceramic Neolithic settlement phase at Knossos, and indigenous developments at several sites from as early as 7000 *bc*. Island hopping and settlement then became a regular pattern across the Aegean, the Adriatic, and the western Mediterranean, spreading some Neolithic elements quite rapidly—new technologies (pottery especially) travelled to the far west of the Mediterranean within a millennium of first appearing—but the dating of these earliest maritime expeditions still needs chronological investigation. Island size and proximity are important factors in the early access and exploitation of otherwise vulnerable new territories (Cherry 1981; 1990; Broodbank 1999; 2000; 2008), and Mesolithic exploitation of obsidian on Melos, and the hunting of indigenous fauna on Sardinia and Corsica (Costa et al. 2003), imply many islands were known before Neolithic colonists ventured west.

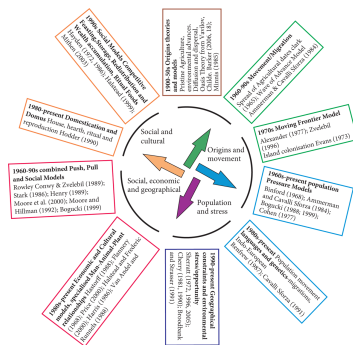
The extensive lowlands of the south-eastern Balkans were ideal for farming, and across Thessaly and Macedonia dense lake-focused tell settlement developed (Perlès 2001). House-building techniques, although derived from the Levant and Anatolia, were adapted to the different conditions, resulting in smaller, rectangular mud/wattle structures with pitched roofs. Inland and upland zones of the Balkans and western Europe, with their harsher climatic conditions, longer winter seasons, higher rainfall, and rocky mountainous terrain to which Levantine species and lifestyle were unsuited, meant low returns and poor reliability. This resulted in a dual model of adaptation and Neolithization west and north of southern Greece and across south-western Europe. This zone may be further divided between the prime agricultural alluvial, coastal, and riverine lands of early permanent Neolithic settlement, which attracted colonization by farmers as the population grew, and the uplands (Pindos, Alps, Apennines, Massif Central, Pyrenees, Meseta, Atlas). In addition, productive traditional landscapes (lakes, forests, estuaries) retained a strong Mesolithic presence long after farming communities became established. These communities obtained Neolithic elements from settled neighbours, such as incised and painted pottery, and adopted sheep/goat pastoralism and perhaps marriage partners, alongside hunting and foraging. Direct colonization is likely between the Dalmatian coast and southern Italy, bearing Balkan-style pottery, domestic plants, and animals. This movement into the central Mediterranean clearly influenced indigenous groups as far away as north Sicily and Liguria by c. 6000 *bc*, with pottery in Mesolithic caves such as Uzzo, Arene Candide, and Praia a Mare (Maggi 1997). In the main settlement zones, substantial ditched settlements developed on the Apulian Tavoliere by the early sixth millennium *bc* and in east Sicily by the mid sixth millennium *bc* (Malone 2003). Ephemeral settlement soon extended across southern and central Italy and Sicily, displacing or absorbing indigenous communities, with mixed farming and pottery at sites like San Marco in Umbria. The process of adoption became slower and was resisted for longer by indigenous groups in the Po Valley, the Alpine fringe, and southern France (c. 5900–5500 *bc*), where fishing, hunting, and gathering persisted alongside new semi-permanent settlement and Neolithic elements (especially Cardial pottery and ovicaprids, Binder 2000). A dual economy is evidenced by cereals at Aberador cave in Languedoc, and sheep/goat at Grotte de Gazel, Azzura Cave, and Château-Les-Martigues (Geddes 1983).

Mediterranean Spain offered different conditions and the 'dual model' of colonization and indigenous Mesolithic occupation certainly applies (Chapman 2008, 16; Bernabeu 2002). Large estuaries (e.g. the Ebro) and coastal areas provided ideal Mesolithic resources at sites such as Cova de l'Or and Covade Les Cendres (Bernabeu 1989), while dense settlement and intensive 'garden' cultivation developed in 'empty' parts of coastal Valencia. Further south a more mobile pattern of small settlements, as shown by survey in the Ronda basin, exploited a combination of wild and grown foods. The harsh conditions of the Meseta delayed Neolithic settlement until c. 5000 *bc*, evident first in caves, then open sites like Los Barruecos. Much of the region may have been sparsely populated (Zilhao 1993; 2000, 144–145) until agriculture became fully established.

The introduction of agriculture to Sardinia, Corsica, and the Balearic islands implies colonization by maritime groups. Mesolithic prospection of the two large islands may begin as early as the 8th–7th millennia *bc*, but pottery and domesticates date only from the early 6th millennium *bc*, implying a slow adoption of farming and settlement (e.g. the cave of Filiestru in north-west Sardinia, Trump et al. 1983; and Basi in Corsica had pottery and domesticates). The much smaller and more remote Balearic islands show no human activity before the late fifth/early fourth millennia *bc*. The pattern of Neolithic spread, adoption, indigenous transformation, colonization, isolation, connectivity, and inter-connectivity across land and seascapes remains an active area of discussion, where no one explanation explains the enormous regional complexity, and long-lived Mesolithic practices still challenge established ideas about colonists from the east (Barker 2005; Cherry 1981; 1990; Rainbird 1999).

The southern rim of the Mediterranean, normally disregarded by European prehistory, also absorbed elements of Neolithic economy and culture. Fringed by the Sahara and the dry Atlas mountains, only the coastal zone could sustain farming or dense populations. In spite of the proximity of early domesticates in the Levant, groups in Egypt only adopted domesticates, herding, and cultivation alongside hunting and fishing in the early 5th millennium *bc* at Nile delta sites like Merimde and a millennium later at Hemamieh further south (Hassan 1998; Barker 2006, 292). A 'pastoral Neolithic' (Barich 1987) dominated along the coast of north Africa and the Maghreb with herding and intensive management of wild Barbary sheep, cattle, gazelle, and hartebeest in the earlier Holocene (Smith 1998). The recently surveyed Tadrat Acacus of south-west Libya (Barker 2006, 294–300) produced Neolithic pottery, lithics, and cave shelters. Abundant rock art in areas now desert attest to the short episode of economic opportunity between c. 6000–4000 *bc*, when the climate was optimally suited to a Neolithic way of life. Pastoralism rather than foraging/hunting and cultivating may actually have been a response to growing aridity that made cultivation unreliable. Indeed, the mobile economy solution, much as recorded by Braudel (1972) millennia later, was the subsistence strategy most suited to the marginal zones of the Mediterranean over its long history.

Origins and models



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Figure 2 Diagram summarizing explanatory models for the spread of farming.

Numerous publications have explored the general theme of economic and social change fundamental to Neolithization (e.g. Cowan and Watson 1992; Gebauer and Price 1992; Harris 1996) and presented models of varying relevance to the Mediterranean region. Theoretical interest is always on the original locations of domestication, not the secondary ones like the Mediterranean. Here the subtle processes that slowly transformed the region from foraging to agriculture have not been effectively addressed by explicit explanatory models. Figure 2 summarizes stages of economic transformation identified by recent researchers. Current approaches favour multistranded cause and effect models, applying a combination of environmental and social factors to the problem of understanding, although not necessarily explaining, Neolithic adoption and change.

Explanatory models for the spread of farming employ environment, population, technological innovation, colonization–migration, and social models (Fig. 2). Population pressure on resources triggering an economic response towards intensification of food procurement has long been identified as a likely factor. So has environmental change, which might generate the same response, or result in genetic mutation and new food opportunities from modified plants and animals. Both factors can lead to migration, invention, and social–economic change. More recent ideas, borrowing from anthropology, have examined the role of social pressure and competition, emulation, prestige feasting, novelty, ritual consumption, and the role of the home/domus in sedentism and changing ideas about food.

Interest in the origins of plants, animals, and farming in the early 20th century generated important debate that became active in the 1950–60s with the possibilities of absolute dating. Grahame Clark's (1965) original model plotted new 14C dates for the earliest occurrence of domestic plants and animals on the map of the Mediterranean and Europe. The 'Wave of Advance' model (Ammerman and Cavalli Sforza 1971; 1973; 1984) expanded this idea and is still being modified as new data come to light (Guilaine 2007, 171; Schmidt 2007; Zeder 2008). Renfrew added the origins of languages (Renfrew 1987; see Shennan, this volume) to this emerging spatial approach, implying that farming and population movement were the trigger to Indo-European language migration. Other cultural elements have been easier to plot, and forms of pottery and houses, lithic technologies, and raw materials may collectively imply a specific 'cultural' identity. Some models seek to explain how and why populations colonize new territory and cross social and economic frontiers (Alexander 1977), including biogeographical approaches relating to island colonization, population densities, size, and distance (Cherry 1981; 1990; Broodbank and Strasser 1991; Rainbird 1999). Islands hold particular interest for archaeological models, given their defined space and identity. John Evans (1973) recognized the usefulness of this approach to Mediterranean islands, suggesting they were 'laboratories' for exploring social change, an idea developed by fieldwork on, for example, Malta, Sardinia, Sicily, Crete, and Cyprus.

Current approaches aim to go beyond simply charting distance, maritime abilities, or even availability of new foods by exploring the many social and cultural factors in the world of Mesolithic–Neolithic peoples. The take-up of new ideas, values, foods, and emerging social organization was reflected in the continued development of distinctive Neolithic societies over the succeeding millennia. These post-processual approaches have examined how status foods and competitive feasting, 'elite dominance', or indigenous responses (e.g. Hayden 1992) might have encouraged communities to add innovations to their cultural and economic repertoire, as well as forming a distinctive Neolithic (and Mediterranean) civilization. In the eastern Mediterranean, settlement itself may have marked the boundary between indigenous and colonist, as defined village concentrations appeared. But as the sense of place and tight community became more diffuse the further west one travelled, other markers became significant in defining identities and origins. In the west Mediterranean, large monuments, whilst mostly intended for burial of ancestors, also marked the different identity between farmers, semi-farmers, pastoralists, and transforming indigenous groups. These identities ultimately shaped the long-term development of the very distinctive regional Neolithic cultures populating the Mediterranean for the next three millennia, also influencing neighbouring northern, western, and central Europe.

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